

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE
BOARD OF PATENT APPEALS AND INTERFERENCES**

In re Patent Application of: Thomas N. Chalin, et al.
Serial No.: 10/600,049
Filed: June 20, 2003
Entitled: SUSPENSION SYSTEM HAVING A
COMPOSITE AXLE
Group Art Unit: 3617
Examiner: J. Bellinger

APPEAL BRIEF

Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Appellants hereby timely submit this Appeal Brief under the provisions of 37 CFR §41.37 and respectfully request consideration thereof before the Board of Patent Appeals and Interferences. Appellants' Notice of Appeal was filed on April 27, 2007, appealing to the Board from the decision of the examiner, mailed January 31, 2007, finally rejecting the claims of the above-identified patent application.

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REAL PARTY IN INTEREST

The real party in interest is the assignee of the present application, Watson & Chalin Manufacturing Inc. of McKinney, Texas.

RELATED APPEALS AND INTERFERENCES

There are no related appeals or interferences known to appellants, the appellants' legal representatives or assignee which will directly affect or be directly affected by or have a bearing on the Board's decision in this appeal.

STATUS OF CLAIMS

Claims 1-52 were originally filed in the present application. Claims 1 and 43 have been canceled. Claims 2-42 and 44-52 remain pending. Claims 5-12, 22-29, 37, 40-42 and 45-52 are withdrawn from consideration pursuant to a requirement for election of species.

Claims 2-4, 13-21, 30-36, 38, 39 and 44 are currently pending and being considered in the application.

Claims 2-4, 13-21, 30-36, 38, 39 and 44 are rejected.

Claims 2-4, 13-21, 30-36, 38, 39 and 44 are being appealed.

STATUS OF AMENDMENTS

No amendments have been filed after the date of the January 31, 2007 Office Action. A previous amendment was filed on November 16, 2006 and was entered, as evidenced in item 1 of the January 31, 2007 Office Action Summary.

SUMMARY OF CLAIMED SUBJECT MATTER

In the following summary of the subject matter recited in the independent claims 2 and 30, the reference numbers and passages of the specification text refer to an embodiment of a suspension system 30 depicted in FIGS. 2-4, in which a composite portion 38 of an axle 36 is received in a metal sleeve 42 at each end thereof, thereby enabling convenient attachment of pivoting beams 34, a metal spindle 40 and brake mounting 44 to the axle.

In one important aspect of the invention recited in independent claim 2, the axle assembly 32 includes an axle 36, with at least a portion 38 of the axle being made of a composite material (see page 6, line 20 to page 7, line 13 of the specification). At least two beams 34 are attached to the axle 36 in a manner preventing rotation of the axle relative to the beams. The beams 34 pivot relative to a vehicle frame (see page 7, lines 1-3).

In another important aspect of the invention recited in independent claim 30, a spindle 40 is attached to the composite portion 38 of the axle 36 (see page 8, lines 3-9), with the spindle being configured to permit rotation of a wheel relative to the axle. This claim also recites the attachment of the pivoting beams 34 to the axle assembly 32 (see page 9, lines 1-4).

GROUND OF REJECTION TO BE REVIEWED ON APPEAL

Claims 30, 31, 33, 36, 38 and 44 are rejected under 35 USC §102(b) as being anticipated by U.S. Published Application No. 2001/0027890 of Bria, et al.

Claim 32 is rejected under 35 USC §103(a) as being obvious over the Bria reference.

Claims 2-4 are rejected under 35 USC §103(a) as being obvious over U.S. Patent No. 5,788,263 to VanDenberg in view of U.S. Patent No. 3,756,646 to Gimlett, et al.

Claims 13-21, 30-36, 38 and 44 are rejected under 35 USC §103(a) as being obvious over the VanDenberg reference in view of the Gimlett reference, and further in view of U.S. Patent No. 983,855 to Aton.

Claim 39 is rejected under 35 USC §103(a) as being obvious over the VanDenberg reference in view of the Gimlett reference, further in view of the Aton reference, and still further in view of U.S. Patent No. 2,370,773 to Bradley.

ARGUMENT

The present invention advances the art of vehicle suspension systems by providing a suspension system with increased load-carrying capacity and reduced weight. Several examples of new suspension systems 30, 50, 60, 70, 80, 90, 100, 110 are described in the specification, and are illustrated in FIGS. 2-13.

One manner of reducing weight and increasing load-carrying capacity in the suspension systems includes the use of composite material in axles and various other suspension components. However, it should be clearly understood that the invention is far more extensive than the mere substitution of composite material for conventional steel suspension components. Instead, the applicants have described with particularity in the specification how to solve the unique problems associated with the use of composite material in certain suspension components.

For example, one problem is that composite materials cannot be welded or fastened using the same techniques as used for steel components. Another problem is that composite materials have deflection characteristics (e.g., modulus of elasticity) which are quite different from those of steel components. As an example of how these problems can be uniquely solved, in FIGS. 2-4 the suspension system 30 is depicted with a composite portion 38 of an axle 36 received in a metal sleeve 42 at each end thereof, thereby enabling convenient attachment of pivoting beams 34, a metal spindle 40 and brake mounting 44 to the axle. One advantage of this unique configuration is that wheels can be rotatably mounted on the spindles 40 at each end of the composite axle 36.

Rejections under 35 USC §102(b) over Bria

Bria describes a vehicle suspension system 6 including an axle 152 which may be made of a composite material (see FIGS. 7 & 8, and paragraph 0105). However, this is where the similarity between the Bria suspension system and the present invention ends. Note that Bria rigidly attaches a hub 154 at each end of the axle 152, and that the wheels 8 are rigidly attached to the hubs with lug nuts 157c.

Thus, no relative rotation is permitted between the axle 152 and the wheels 8. Instead, the wheels 8 and axle 152 rotate together as part of an overall assembly 149 which also includes brake discs 156 rigidly attached to the axle. If this were not true, then the clamping force exerted by the brake calipers 181 on the discs 156 (see FIG. 8 and paragraph 0111) would have no effect on rotation of the wheels 8, and the vehicle would not stop.

Claims 30 and 44

Independent claim 30 recites that a suspension system includes an axle assembly including a composite axle portion and a spindle attached to the composite axle portion. An example of this arrangement is depicted in FIGS. 2-4, wherein it may be seen that the spindle 40 is attached to a composite axle portion 38. Further, claim 30 recites that the spindle is configured to permit rotation of a wheel relative to the axle.

In contrast, Bria does not describe a spindle as that term is used in the present specification. Instead, Bria describes attaching a spline 153 at each end of the axle 152. The splines 153 are used for rigidly attaching a hub 154 at each end of the axle 152, as discussed above (also see paragraphs 0102-0104).

Furthermore, Bria does not describe any spindle attached to an axle, which spindle permits rotation of a wheel relative to the axle. Instead, Bria clearly describes that the wheels 8 rotate with the axle 152, i.e., with no relative rotation therebetween.

Anticipation requires that every limitation recited in a claim be specifically described or inherent in the teachings of a reference. Since Bria does not describe every limitation of claim 30, this claim is not anticipated by Bria. Accordingly, the Board is

respectfully requested to direct the withdrawal of the rejections of claim 30 and its dependents.

Claim 31

This claim is dependent from claim 30 and, for the same reasons discussed above, is not anticipated by Bria. In addition, claim 31 recites that the spindle is attached to a sleeve at least partially overlying the composite axle portion.

Bria does not describe a spindle, and does not describe a spindle attached to a sleeve which overlies a composite axle portion. Therefore, Bria does not anticipate claim 31, and the Board is respectfully requested to direct the withdrawal of the rejections of claim 31 and its dependents.

Claim 33

This claim is dependent from claim 31 and, for the same reasons discussed above, is not anticipated by Bria. In addition, claim 33 recites that the suspension system further includes an axle seat attached to the sleeve.

Bria does not describe the sleeve recited in claim 31 (which sleeve overlies the composite axle portion and is attached to the spindle), and therefore cannot describe an axle seat attached to the sleeve. Therefore, Bria does not anticipate claim 33, and the Board is respectfully requested to direct the withdrawal of the rejections of claim 33 and its dependents.

Claim 36

This claim is dependent from claim 30 and, for the same reasons discussed above, is not anticipated by Bria. In addition, claim 36 recites that the composite axle portion is received within an interior of the spindle.

Bria does not describe the spindle recited in claim 30 (which spindle permits rotation of a wheel relative to the axle), and therefore cannot describe a composite axle portion received within an interior of the spindle. Therefore, Bria does not anticipate claim 36, and the Board is respectfully requested to direct the withdrawal of the rejection of claim 36.

Claim 38

This claim is dependent from claim 30 and, for the same reasons discussed above, is not anticipated by Bria. In addition, claim 38 recites that the spindle is bonded to the composite axle portion.

Bria does not describe the spindle recited in claim 30 (which spindle permits rotation of a wheel relative to the axle), and therefore cannot describe the spindle being bonded to the composite axle portion. Therefore, Bria does not anticipate claim 38, and the Board is respectfully requested to direct the withdrawal of the rejection of claim 38.

Rejection under 35 USC §103(a) over Bria

Claim 32

This claim is dependent from claim 31 and, for the same reasons discussed above, all of the limitations of this claim are not described or inherent in the Bria reference. In addition, claim 32 recites that the spindle is welded to the sleeve.

Bria does not describe the spindle recited in claim 30, and does not describe the sleeve recited in claim 31. Therefore, Bria cannot describe the spindle being welded to the sleeve.

As stated in MPEP §2143, part of the fundamental basis for a *prima facie* case of obviousness is that the reference(s) must teach or suggest all of the limitations recited in a claim. In the present case, the reference clearly does not teach or suggest that a spindle which permits rotation of a wheel relative to an axle, and which is attached to a composite portion of the axle, is also welded to a sleeve overlying the composite portion of the axle. Therefore, a *prima facie* case of obviousness of claim 32 has not been made out, and the Board is respectfully requested to direct the withdrawal of the rejection of claim 32.

Rejections under 35 USC §103(a) over VanDenberg in view of Gimlett

The first step in the *Graham v. John Deere* factual inquiries, which are used as a background for determining obviousness, is to determine the scope and content of the prior art. In the present case, all of the claims being considered have been rejected as obvious over a proposed combination of at least the teachings of the VanDenberg and Gimlett references. An analysis of each of these references follows.

VanDenberg describes a suspension system having laminated beams 15 which pivot relative to a vehicle frame 6. The beams 15 are connected to an axle 19 by wrapping layers of the laminate material about the axle (see col. 5, lines 38-54). Since the beams must both pivot and deflect laterally as the vehicle negotiates turns, it is important that the beams have a modulus of elasticity which is significantly less than that of the axle (see col. 6, lines 9-18). This important difference in modulus of elasticity is said to result in a condition in which, “the axle will be permitted to move to an out-of-round condition, and deflect relative to trailing beams 15 without causing the beam to fracture as the material will permit the beam to remain firmly attached to the axle as the axle responds to forces received from tire-wheel assemblies 21.”

Gimlett describes a very different configuration. Instead of a pivoting beam-type suspension system, Gimlett describes a railway wheel and axle assembly, in which a portion of each of the wheels and axle are made of a composite material. For the axle 2, an inner metal core 4 is covered with the composite material 3. An inner composite material portion 8 of each of the wheels 1 is bonded to the composite material 3 of the axle 2 to thereby produce a one-piece integral assembly. Note that there is no teaching or suggestion in Gimlett or VanDenberg of how such an axle assembly could be incorporated into a pivoting beam-type suspension system in which the axle is prevented from rotating relative to the beams, since the axle assembly of Gimlett is instead intended for use in a railway application where the axle and wheels rotate together.

The *Graham v. John Deere* inquiries also include an evaluation of the level of skill of the ordinary artisan. In the present case, the person of ordinary skill in the art

would likely have a bachelor's degree in mechanical engineering, and would likely have several years of experience in designing vehicle suspension systems.

And finally, the *Graham v. John Deere* inquiries include an evaluation of the differences between the prior art and the claimed invention, and a determination of whether the person of ordinary skill in the art would have found the claimed invention obvious in light of the teachings of the prior art, using the inquiries as a background for this determination. This portion of the *Graham v. John Deere* analysis is presented below for each of the rejected claims.

Claim 2

This independent claim recites a suspension system which includes an axle having a portion made of a composite material, with at least two beams attached to the axle. The beams pivot relative to a vehicle frame, but the axle is prevented from rotating relative to the beams. As discussed above, the applicants have described in the specification how to make and use such a unique suspension system, and they are thus permitted to claim the suspension system in the present application.

Neither of the VanDenberg and Gimlett references describes the suspension system recited in claim 2. Instead, VanDenberg describes a suspension system in which the beams, not the axle, are made of a laminated material, and Gimlett describes a suspension system in which an integral axle-wheel assembly is fabricated using composite materials for use in a railway application in which the axle and wheels rotate together. Clearly, neither of these references suggests the invention recited in claim 2, and neither of these references would motivate a person skilled in the art to produce the invention of claim 2. For at least these reasons, a *prima facie* case of obviousness has not been made out for claim 2, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 2 and its dependents.

In addition, there is no reason that a person skilled in the art would make the combination of these references proposed by the examiner. As stated in MPEP §2143.01, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In the present case, there is not even the premise that the references

could be combined (how would a rotating axle be attached to a pivoting beam?), and the references certainly do not suggest any desirability of the combination. Therefore, for this additional reason a *prima facie* case of obviousness has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 2 and its dependents.

Furthermore, it is axiomatic that a proposed combination of references is improper where the references teach away from their combination (see MPEP §2145 X.D.2). In the present case, the VanDenberg reference teaches that the pivoting beams should have a modulus of elasticity which is significantly less than that of the axle, so that the beam can allow for out-of-round deflections of the axle in response to various loadings. Thus, VanDenberg teaches that the beam, not the axle, should be constructed using the laminated material. Gimlett teaches the opposite – that the axle itself should be made using composite material. Of course, Gimlett contains not teaching whatsoever regarding beam construction, since Gimlett also contains no teaching as to how an axle made using composite material could be attached to pivoting beams.

In order for a person skilled in the art to make the combination of these references proposed by the examiner in the Office Action, the person would have to completely disregard the VanDenberg teachings regarding desirable differences in modulus of elasticity. Clearly, a person skilled in the art would not have found it obvious at the time the invention was made to combine the teachings of the VanDenberg and Gimlett references as proposed in the Office Action. Therefore, for this additional reason a *prima facie* case of obviousness has not been made out, and the Board is respectfully requested to direct withdrawal of the rejections of claim 2 and its dependents.

Claim 3

Claim 3 is dependent upon claim 2, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 3. In addition, claim 3 recites that the composite portion of the axle extends at least between the pivoting beams. Thus, claim 3 recites that not just any portion of the axle is made of a

composite material, instead the composite material portion must extend at least between the pivoting beams.

Neither of the VanDenberg and Gimlett references contain any teachings whatsoever regarding this feature of the invention recited in claim 3. VanDenberg does not describe any positioning of any composite portion of an axle. Gimlett also does not describe any positioning of any composite portion of an axle relative to any pivoting beams, since Gimlett does not describe any axle for use with pivoting beams, and does not describe any pivoting beams at all.

As discussed above, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that a composite portion of an axle should extend between pivoting beams. Therefore, for this additional reason a *prima facie* case of obviousness of claim 3 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 3.

Claim 4

Claim 4 is dependent upon claim 2, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 4. In addition, claim 4 recites that the composite portion of the axle extends through the pivoting beams. Thus, claim 4 recites that the composite portion of the axle is not attached to the beams in just any manner, instead the composite material portion must extend through the pivoting beams.

Neither of the VanDenberg and Gimlett references contain any teachings whatsoever regarding this feature of the invention recited in claim 4. VanDenberg does not describe any positioning of any composite portion of an axle. Gimlett also does not describe any positioning of any composite portion of an axle relative to any pivoting beams, since Gimlett does not describe any axle for use with pivoting beams, and does not describe any pivoting beams at all.

A *prima facie* case of obviousness requires that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references

clearly do not teach or suggest that a composite portion of an axle should extend through pivoting beams. Therefore, for this additional reason a *prima facie* case of obviousness of claim 4 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 4.

Rejections under 35 USC §103(a) over VanDenberg in view of Gimlett, and further in view of Aton

The Aton reference is used in these claim rejections for its teaching of a spindle 1 attached at each end of an axle 2 using a threaded sleeve 12. This arrangement allows for convenient replacement of the spindle when it becomes worn. Filed near the beginning of the automobile era (1910), this invention allows for the use of the inferior (by today's standards) materials of the time in spindles, which consequently resulted in the need for frequent replacement. Note that the Aton reference does not describe any use of composite materials in the axle 2, nor does the reference describe how such an axle could be used in a pivoting beam suspension system.

In contrast, the present application describes several examples of how to make and use a suspension system in which a spindle 40 is permanently attached to a composite portion 38 of an axle 36 which is also attached to pivoting beams 34. These unique features of the invention are not suggested by any of the references cited in the claim rejections.

Claim 13

This claim is dependent on claim 2, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 13. In addition, claim 13 recites that the suspension system includes at least two metal sleeves secured exteriorly about the axle composite portion. Note that claim 13 does not merely recite two metal sleeves, instead the claim recites a particular arrangement of the elements in the suspension system.

While the Aton reference does describe the two threaded sleeves 12, there is absolutely no teaching whatsoever in the reference that the sleeves are metal, or that the

sleeves are positioned in any particular manner relative to a composite portion of the axle 2. As taught by VanDenberg, the particular materials of which components in a suspension system are constructed is an important consideration in the satisfactory functioning of the suspension system. In the present case, the Aton reference does not teach or suggest either of the materials recited in claim 13, and does not even provide a hint as to how its sleeves could be incorporated into the VanDenberg or Gimlett references.

As discussed above, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that metal sleeves should be secured exteriorly about a composite portion of an axle. Therefore, for this additional reason a *prima facie* case of obviousness of claim 13 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 13 and its dependents.

Claim 14

This claim is dependent on claim 13, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 14. In addition, claim 14 recites that each of the pivoting beams is attached to a respective one of the sleeves. Note that claim 14 does not merely recite any attachment between the pivoting beams and the axle, instead the claim specifically recites that the pivoting beams are attached to the sleeves, which are exterior to the composite portion of the axle.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Indeed, none of the cited references contains any teaching of a composite portion of an axle being attached to a pivoting beam at all, much less a teaching of an exterior sleeve on the composite portion of the axle being attached to a pivoting beam. Instead, the references teach very different suspension systems and railway axles.

As discussed above, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a

claim. In the present case, the references clearly do not teach or suggest that metal sleeves should be secured exteriorly about a composite portion of an axle, or that the metal sleeves should be attached to any pivoting beams. Therefore, for this additional reason a *prima facie* case of obviousness of claim 14 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 14.

Claim 15

This claim is dependent on claim 13, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 15. In addition, claim 15 recites that each of the sleeves is bonded to the composite portion of the axle. Note that claim 15 does not merely recite any attachment between the sleeves and the axle, instead the claim specifically recites that the sleeves are bonded to the composite portion of the axle.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Instead, Aton describes the sleeves 12 being threaded onto ends of the axle 2. Indeed, none of the cited references contains any teaching of a sleeve being bonded to a composite portion of an axle.

As discussed above, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that metal sleeves should be bonded to an axle, or that the metal sleeves should be attached to any composite portion of an axle. Therefore, for this additional reason a *prima facie* case of obviousness of claim 15 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 15.

Claim 16

This claim is dependent on claim 13, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 16. In addition, claim 16 recites that each of the pivoting beams is welded to a respective one of the sleeves. Note that claim 16 does not merely recite any attachment between

the pivoting beams and the sleeves, instead the claim specifically recites that the pivoting beams are attached to the sleeves by welding.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Indeed, none of the cited references contains any teaching of a composite portion of an axle being attached to a pivoting beam at all, much less a teaching of an exterior sleeve on the composite portion of the axle being welded to a pivoting beam. Instead, the references teach very different suspension systems and railway axles.

As discussed above, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that metal sleeves should be secured exteriorly about a composite portion of an axle, or that the metal sleeves should be welded to any pivoting beams. Therefore, for this additional reason a *prima facie* case of obviousness of claim 16 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 16.

Claim 17

This claim is dependent on claim 13, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 17. In addition, claim 17 recites that the composite portion of the axle extends through each of the sleeves. Note that claim 17 does not merely recite any arrangement of the sleeves and axle, instead the claim specifically recites that the composite portion of the axle extends through each of the sleeves.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Instead, Aton describes the sleeves 12 being threaded onto ends of the axle 2. A threaded portion of the axle 2 does extend through the sleeves 12, but this is not a composite portion of the axle. Indeed, none of the cited references contains any teaching of a sleeve having a composite portion of an axle extending threrethrough.

As discussed above, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a

claim. In the present case, the references clearly do not teach or suggest that metal sleeves should be attached to any composite portion of an axle, or that the composite portion of the axle should extend through the sleeves. Therefore, for this additional reason a *prima facie* case of obviousness of claim 17 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 17.

Claim 18

This claim is dependent on claim 13, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 18. In addition, claim 18 recites that each of two axle seats is interconnected between a respective one of the sleeves and a respective one of the beams. Note that claim 18 recites a very specific arrangement of the components of the suspension system.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Indeed, none of the cited references contains any teaching of an axle seat being interconnected between a pivoting beam and a composite portion of an axle, much less an axle seat being interconnected between a pivoting beam and a sleeve on the composite portion of the axle.

In the Office Action (page 4) the examiner states that, “As shown in VanDenberg, the portion of each beam end 18 that surrounds the axle 19 acts as a pair of axle seats. These axle seats would be interconnected between the sleeves 12 of Aton and the beams 15 of VanDenberg.” Just because the examiner might be able to imagine a way in which the elements of the various references could be rearranged to allegedly meet the limitations recited in the claim does not mean that the claim is therefore obvious over the references. In the present case, attachment of the sleeves 12 of Aton to the beam ends 18 of VanDenberg would defeat the purpose for the sleeves (to provide for replacement of the spindles 1). In any event, there simply is no motivation in the art to make the rearrangement and combination of the teachings of the references imagined by the examiner.

Again, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the

present case, the references clearly do not teach or suggest that metal sleeves should be secured exteriorly about a composite portion of an axle, or that axle seats should be interconnected between the sleeves and pivoting beams. Therefore, for this additional reason a *prima facie* case of obviousness of claim 18 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 18.

Claim 19

This claim is dependent on claim 13, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 19. In addition, claim 19 recites that spindles are attached to the sleeves, which are exterior to the composite portion of the axle. Note that claim 19 does not merely recite that the suspension system includes spindles, instead the spindles are attached to the sleeves, which are exteriorly secured to the composite portion of the axle, with the axle being attached to the pivoting beams.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention, other than the spindle 1 threaded into the sleeve 12. Clearly, a person skilled in the art would not be motivated to combine the spindle 1 and threaded sleeve 12 of Aton with the suspension system of VanDenberg or the railway integral axle-wheel of Gimlett. Furthermore, the combination proposed by the examiner results from an attempted piecemeal assembly of the elements of the references, obviously using the applicants' claim as a "recipe" (the infamous use of the applicants' disclosure against them). Therefore, for these additional reasons a *prima facie* case of obviousness of claim 19 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 19 and its dependents.

Claim 20

Claim 20 is dependent upon claim 19, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 20. In addition, claim 20 recites that the composite portion of the axle extends into each of the spindles. Thus, claim 20 recites not that the composite portion of the axle is

attached to the spindles in just any manner, instead the composite material portion must extend into each of the spindles.

Neither of the VanDenberg and Gimlett references contain any teachings whatsoever regarding this feature of the invention recited in claim 20. VanDenberg does not describe any positioning of any composite portion of an axle. Gimlett also does not describe any positioning of any composite portion of an axle inside any spindle, since the axle and wheels are an integral assembly and no spindle is used. Aton also does not describe any composite portion of an axle extending into a spindle.

The combination of these references proposed by the examiner results from an attempted piecemeal assembly of the elements of the references, using the applicants' claim and the "hindsight reasoning" warned against in the MPEP. Therefore, for these additional reasons a *prima facie* case of obviousness of claim 20 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 20.

Claim 21

This claim is dependent on claim 19, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 21. In addition, claim 21 recites that each of the spindles is bonded to the composite portion of the axle. Note that claim 21 does not merely recite any attachment between the spindles and the axle, instead the claim specifically recites that the spindles are bonded to the composite portion of the axle.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Instead, Aton describes the spindles 1 being threaded into the sleeves 12. Indeed, none of the cited references contains any teaching of a spindle being bonded to a composite portion of an axle.

As discussed above, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that spindles should be bonded to an axle, or that the spindles should be attached to any composite portion of an axle. Therefore, for this additional reason a *prima facie* case of

obviousness of claim 21 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 21.

Claim 30

This independent claim recites a suspension system which includes an axle having a portion made of a composite material, with at least two beams attached to the axle. The beams pivot relative to a vehicle frame. A spindle is attached to the composite portion of the axle. As discussed above, the applicants have described in the specification how to make and use such a unique suspension system, and they are thus permitted to claim the suspension system in the present application.

Neither of the VanDenberg and Gimlett references describes the suspension system recited in claim 30. Instead, VanDenberg describes a suspension system in which the beams, not the axle, are made of a laminated material, and Gimlett describes a suspension system in which an integral axle-wheel assembly is fabricated using composite materials for use in a railway application in which the axle and wheels rotate together. Clearly, neither of these references suggests the invention recited in claim 30, and neither of these references would motivate a person skilled in the art to produce the invention of claim 30. For at least these reasons, a *prima facie* case of obviousness has not been made out for claim 30, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 30 and its dependents.

In addition, there is no reason that a person skilled in the art would make the combination of these references proposed by the examiner. As stated in MPEP §2143.01, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination. In the present case, there is not even the premise that the references could be combined (how would a rotating axle be attached to a pivoting beam?), and the references certainly do not suggest any desirability of the combination. Therefore, for this additional reason a *prima facie* case of obviousness has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 30 and its dependents.

Furthermore, it is axiomatic that a proposed combination of references is improper where the references teach away from their combination (see MPEP §2145 X.D.2). In the present case, the VanDenberg reference teaches that the pivoting beams should have a modulus of elasticity which is significantly less than that of the axle, so that the beam can allow for out-of-round deflections of the axle in response to various loadings. Thus, VanDenberg teaches that the beam, not the axle, should be constructed using the laminated material. Gimlett teaches the opposite – that the axle itself should be made using composite material. Of course, Gimlett contains not teaching whatsoever regarding beam construction, since Gimlett also contains no teaching as to how an axle made using composite material could be attached to pivoting beams. Therefore, for this additional reason a *prima facie* case of obviousness has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 30 and its dependents.

The Aton reference is used in this rejection of claim 30 for its teaching of the spindle 1 attached to the axle 2. However, the Board will appreciate that Aton contains no teaching whatsoever of the spindle 1 being attached to a composite portion of an axle. The only composite portion of an axle is found in the Gimlett reference, and this reference has no use of a spindle since its axle and wheels rotate together as an integral assembly. Thus, there is no motivation to make the combination of references proposed by the examiner, and for this additional reason a *prima facie* case of obviousness has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 30 and its dependents.

Claim 31

This claim is dependent on claim 30, and for at least the reasons discussed above a *prima facie* case of obviousness of claim 31 has not been made out. In addition, claim 31 recites that the spindle is attached to a sleeve at least partially overlying the composite axle portion. Claim 31 does not recite just any attachment of the spindle to the axle, instead the claim recites a specific attachment between the spindle and the composite portion of the axle.

Aton describes the spindle 1 being attached to the sleeve 12. However, the sleeve does not overlie a composite portion of the axle 2. Indeed, there is no composite portion of the axle 2. The only composite axle portion in the cited combination of references is found in the Gimlett reference. A person skilled in the art would definitely not be motivated to attach a spindle to the axle of Gimlett, since the wheels of Gimlett rotate along with the axle and there is no use for a spindle. For these additional reasons the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 31 and its dependents.

Claim 32

This claim is dependent on claim 31, and for at least the same reasons discussed above a *prima facie* case of obviousness of claim 32 has not been made out. In addition, claim 32 recites that the spindle is welded to the sleeve.

There is no teaching whatsoever in any of the cited references of a spindle being welded to a sleeve. Instead, Aton teaches that the spindle 1 should be threaded into the sleeve 12. This is what makes the spindle 1 conveniently replaceable when it wears out. To weld the spindle 1 to the sleeve 12 would make it unsuited for its intended purpose. Neither VanDenberg nor Gimlett contain any teachings of a spindle attached in any manner to a sleeve.

As discussed above, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that a spindle should be welded to a sleeve, or that the spindle should be attached in any manner to any composite portion of an axle. Therefore, for this additional reason a *prima facie* case of obviousness of claim 32 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 32.

Claim 33

This claim is dependent on claim 31, and for at least the same reasons discussed above a *prima facie* case of obviousness of claim 33 has not been made out. In addition, claim 33 recites that an axle seat is attached to the sleeve.

There is no teaching whatsoever in any of the cited references of an axle seat being attached to a sleeve. Instead, Aton teaches that the sleeve 12 is threaded onto the axle 2. No axle seat is described by Aton at all. Neither VanDenberg nor Gimlett contain any teachings of an axle seat attached in any manner to a sleeve. The examiner identifies an end of the beam of VanDenberg as being the recited axle seat, but there is no attachment between this alleged axle seat and any sleeve, and there is no valid reason why a person skilled in the art would attach this alleged axle seat to the sleeve of Aton. Therefore, for these additional reasons a *prima facie* case of obviousness of claim 33 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 33 and its dependents.

Claim 34

This claim is dependent on claim 33, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 34. In addition, claim 34 recites that the axle seat is interconnected between the sleeve and one of the beams. Note that claim 34 recites a very specific arrangement of these components of the suspension system.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Indeed, none of the cited references contains any teaching of an axle seat being interconnected between a pivoting beam and a composite portion of an axle, much less an axle seat being interconnected between a pivoting beam and a sleeve on the composite portion of the axle.

In the Office Action (page 4) the examiner states that, "As shown in VanDenberg, the portion of each beam end 18 that surrounds the axle 19 acts as a pair of axle seats. These axle seats would be interconnected between the sleeves 12 of Aton and the beams 15 of VanDenberg." Just because the examiner might be able to imagine a way in which the elements of the various references could be rearranged to allegedly meet the limitations recited in the claim does not mean that the claim is therefore obvious over the references. In the present case, attachment of the sleeves 12 of Aton to the beam ends 18 of VanDenberg would defeat the purpose for the sleeves (to provide for replacement of the spindles 1). In any event, there simply is no motivation in the art to

make the rearrangement and combination of the teachings of the references imagined by the examiner.

Again, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that metal sleeves should be secured exteriorly about a composite portion of an axle, or that axle seats should be interconnected between the sleeves and pivoting beams. Therefore, for this additional reason a *prima facie* case of obviousness of claim 34 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejections of claim 34 and its dependent.

Claim 35

This claim is dependent on claim 34, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 35. In addition, claim 35 recites that the axle seat is welded to the sleeve and to one of the pivoting beams. Note that claim 35 does not merely recite any attachment between the pivoting beam and the axle seat, instead the claim specifically recites that the axle seat is attached to both the sleeve and the pivoting beam by welding.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Indeed, none of the cited references contains any teaching of a composite portion of an axle being attached to a pivoting beam at all, much less a teaching of an exterior sleeve on the composite portion of the axle being welded to an axle seat, or of the axle seat also being welded to the pivoting beam. Instead, the references teach very different suspension systems and railway axles.

Again, a part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that a sleeve should be secured exteriorly about a composite portion of an axle, or that the sleeve should be welded to an axle seat, or that the axle seat should also be welded to a pivoting beam. Therefore, for this additional reason a *prima facie* case of obviousness of claim 35 has

not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 35.

Claim 36

Claim 36 is dependent upon claim 30, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 36. In addition, claim 36 recites that the composite portion of the axle is received within an interior of the spindle. Thus, claim 36 does not recite that the composite portion of the axle is attached to the spindles in just any manner, instead the composite material portion must extend into an interior of the spindle.

Neither of the VanDenberg and Gimlett references contain any teachings whatsoever regarding this feature of the invention recited in claim 36. VanDenberg does not describe any positioning of any composite portion of an axle. Gimlett also does not describe any positioning of any composite portion of an axle inside any spindle, since the axle and wheels are an integral assembly and no spindle is used. Aton also does not describe any composite portion of an axle extending into a spindle.

The combination of these references proposed by the examiner results from an attempted piecemeal assembly of the elements of the references, using the applicants' claim and the "hindsight reasoning" warned against in the MPEP. Therefore, for these additional reasons a *prima facie* case of obviousness of claim 36 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 36.

Claim 38

This claim is dependent on claim 30, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 38. In addition, claim 38 recites that the spindle is bonded to the composite portion of the axle. Note that claim 38 does not merely recite any attachment between the spindle and the axle, instead the claim specifically recites that the spindle is bonded to the composite portion of the axle.

The Aton reference contains absolutely no teaching whatsoever of these features of the invention. Instead, Aton describes the spindles 1 being threaded into the sleeves 12. Indeed, none of the cited references contains any teaching of a spindle being bonded to a composite portion of an axle.

Part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that spindles should be bonded to an axle, or that the spindles should be attached to any composite portion of an axle. Therefore, for this additional reason a *prima facie* case of obviousness of claim 38 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 38.

Claim 44

Claim 44 is dependent upon claim 30, and so for at least the same reasons discussed above, a *prima facie* case of obviousness has not been made out for claim 44. In addition, claim 44 recites that the composite portion of the axle extends through the pivoting beams. Thus, claim 44 recites that the composite portion of the axle is not attached to the beams in just any manner, instead the composite material portion must extend through the pivoting beams.

None of the VanDenberg, Gimlett and Aton references contain any teachings whatsoever regarding this feature of the invention recited in claim 44. VanDenberg does not describe any positioning of any composite portion of an axle. Gimlett also does not describe any positioning of any composite portion of an axle relative to any pivoting beams, since Gimlett does not describe any axle for use with pivoting beams, and does not describe any pivoting beams at all. Similarly, Aton does not describe any composite portion of an axle, does not describe any pivoting beams, and does not describe any axle extending through any beams.

Again, part of the fundamental basis for a *prima facie* case of obviousness is that the references must teach or suggest all of the limitations recited in a claim. In the present case, the references clearly do not teach or suggest that a composite portion of an axle should extend through pivoting beams. Therefore, for this additional reason a

prima facie case of obviousness of claim 44 has not been made out, and the Board is respectfully requested to direct the examiner to withdraw the rejection of claim 44.

Rejection under 35 USC §103(a) over VanDenberg in view of Gimlett, further in view of Aton, and still further in view of Bradley

The Bradley reference is used in this claim rejection for its teaching of a spindle 12 and a brake drum 38. The spindle 12 is replaceable, similar in some respects to the replaceable spindle of Aton. However, in this case the axle assembly also has the brake drum 38 attached thereto adjacent the spindle.

Note that the Bradley reference does not describe any use of composite materials in the axle assembly, nor does the reference describe how such an axle could be used in a pivoting beam suspension system.

Claim 39

This claim is dependent on claim 30, and so for the same reasons discussed above a *prima facie* case of obviousness of claim 39 has not been made out. In addition, claim 39 recites that a brake mounting is attached to the spindle.

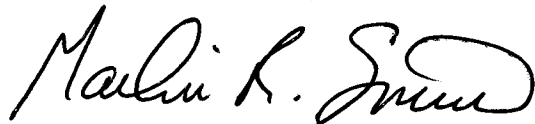
In the Bradley reference the brake drum 38 is attached to a body section 10 of the axle assembly. The spindle 12 is releasably attached to the body section, as well. In this manner, it may be considered that an attachment is made between the brake drum 38 and the spindle 12. However, this does not change the fact that an improper combination of references is made in the claim rejection.

The combination of references proposed by the examiner simply does not suggest how an axle having a composite portion can be attached to pivoting beams in a suspension system, or how a spindle may be attached to the composite portion of the axle. Bradley describes the spindle 12 as being wedged into an end of an axle body section, and the brake drum 38 being riveted to the axle body section. Would these attachment methods work with a composite axle portion? No-one knows, because none of the references has explained how the problems of incorporating a composite portion of an axle into a pivoting beam-type suspension system could be accomplished.

The only ones who have solved these problems are the present applicants. These applicants have fulfilled the requirements of the patent statutes and rules by disclosing to the public how to solve these problems, which no-one else in the art has yet been able to solve. These applicants have submitted their specification describing the best modes they know of for practicing their invention, paid the prescribed fees, complied with the various rules of the Patent Office, and are now being denied what is promised to them in Article I, Section 8 of the U.S. Constitution -- the exclusive right to their invention. The applicants respectfully request that the Board correct this injustice.

Respectfully submitted,

SMITH IP SERVICES, P.C.



Marlin R. Smith
Attorney for Applicants
Registration No. 38,310

Dated: June 26, 2007

P.O. Box 997
Rockwall, Texas 75087
(972) 516-0030 (phone)
(972) 516-0608 (fax)

I hereby certify that this correspondence is being
filed in the U.S. Patent and Trademark Office
electronically via EFS-Web, on June 26, 2007.



CLAIMS APPENDIX

1. (canceled)
2. A suspension system, comprising:
an axle assembly including an axle, at least a portion of the axle being made of a composite material; and
at least two beams attached to the axle, thereby preventing rotation of the axle relative to the beams, the beams pivoting relative to a vehicle frame.
3. The suspension system according to claim 2, wherein the axle portion extends at least between the beams.
4. The suspension system according to claim 2, wherein the axle portion extends through each of the beams.
5. The suspension system according to claim 2, wherein each of the beams is bonded to the axle portion.
6. The suspension system according to claim 2, wherein each of the beams includes at least a composite portion.
7. The suspension system according to claim 6, wherein each of the beam composite portions is wrapped about the axle assembly.

8. The suspension system according to claim 6, wherein each of the beam composite portions has a generally H-shaped cross-section.

9. The suspension system according to claim 6, wherein each of the beam composite portions has a generally I-shaped cross-section.

10. The suspension system according to claim 6, wherein each of the beam composite portions is bonded to the axle assembly.

11. The suspension system according to claim 6, wherein each of the beam composite portions is wrapped about a pivot bushing sleeve for pivoting attachment of the beam to the vehicle frame.

12. The suspension system according to claim 6, wherein each of the beam composite portions is bonded to a beam metal end, the beam metal end including a pivot bushing sleeve for pivoting attachment of the beam to the vehicle frame.

13. The suspension system according to claim 2, further comprising at least two metal sleeves secured exteriorly about the axle composite portion.

14. The suspension system according to claim 13, wherein each of the beams is attached to a respective one of the sleeves.

15. The suspension system according to claim 13, wherein each of the sleeves is bonded to the axle composite portion.

16. The suspension system according to claim 13, wherein each of the beams is welded to a respective one of the sleeves.

17. The suspension system according to claim 13, wherein the axle composite portion extends through each of the sleeves.

18. The suspension system according to claim 13, further comprising at least two axle seats, each of the axle seats being interconnected between a respective one of the sleeves and a respective one of the beams.

19. The suspension system according to claim 13, further comprising at least two spindles, each of the spindles being attached to a respective one of the sleeves.

20. The suspension system according to claim 19, wherein the axle composite portion extends into each of the spindles.

21. The suspension system according to claim 19, wherein each of the spindles is bonded to the axle composite portion.

22. The suspension system according to claim 2, further comprising at least two axle seats, each of the axle seats being

interconnected between the axle composite portion and a respective one of the beams.

23. The suspension system according to claim 22, wherein each of the axle seats is bonded to the axle composite portion.

24. The suspension system according to claim 22, wherein each of the axle seats is welded to a respective one of the beams.

25. The suspension system according to claim 22, further comprising at least two spindles, each of the spindles being attached to a respective end of the axle composite portion.

26. The suspension system according to claim 25, wherein each of the spindles is received in its respective end of the axle composite portion.

27. The suspension system according to claim 25, wherein each respective end of the axle composite portion is received in one of the spindles.

28. The suspension system according to claim 25, wherein each of the spindles is bonded to the axle composite portion.

29. The suspension system according to claim 25, further comprising at least two brake mountings, each of the brake mountings being attached to a respective one of the spindles.

30. A suspension system, comprising:

an axle assembly including a composite axle portion and a spindle attached to the composite axle portion, the spindle being configured to permit rotation of a wheel relative to the axle; and

at least two beams attached to the axle assembly, the beams pivoting relative to a vehicle frame.

31. The suspension system according to claim 30, wherein the spindle is attached to a sleeve at least partially overlying the composite axle portion.

32. The suspension system according to claim 31, wherein the spindle is welded to the sleeve.

33. The suspension system according to claim 31, further comprising an axle seat attached to the sleeve.

34. The suspension system according to claim 33, wherein the axle seat is interconnected between the sleeve and one of the beams.

35. The suspension system according to claim 34, wherein the axle seat is welded to each of the sleeve and the one of the beams.

36. The suspension system according to claim 30, wherein the composite axle portion is received within an interior of the spindle.

37. The suspension system according to claim 30, wherein the spindle is received within an interior of the composite axle portion.

38. The suspension system according to claim 30, wherein the spindle is bonded to the composite axle portion.

39. The suspension system according to claim 30, further comprising a brake mounting attached to the spindle.

40. The suspension system according to claim 30, further comprising an axle seat interconnected between the composite axle portion and one of the beams.

41. The suspension system according to claim 40, wherein the axle seat is welded to the beam.

42. The suspension system according to claim 40, wherein the axle seat is bonded to the composite axle portion.

43. (canceled)

44. The suspension system according to claim 30, wherein the composite axle portion extends through the beams.

45. The suspension system according to claim 30, wherein each of the beams includes a portion made of a composite material.

46. The suspension system according to claim 45, wherein each composite beam portion has a generally H-shaped cross-section.

47. The suspension system according to claim 45, wherein each composite beam portion has a generally I-shaped cross-section.

48. The suspension system according to claim 45, wherein each composite beam portion is bonded to the composite axle portion.

49. The suspension system according to claim 45, wherein each composite beam portion is wrapped about the composite axle portion.

50. The suspension system according to claim 45, wherein each beam further includes a pivot bushing sleeve.

51. The suspension system according to claim 50, wherein each composite beam portion is wrapped about the respective pivot bushing sleeve.

52. The suspension system according to claim 50, wherein each pivot bushing sleeve is part of a metal end of the respective beam, the metal end being attached to the respective composite beam portion, and each respective composite beam portion being attached to the composite axle portion.

EVIDENCE APPENDIX

(none)

RELATED PROCEEDINGS APPENDIX

(none)